Appendix C
Public Safety

1. Chronological List of LNG Accidents

Major LNG Incidents							
Incident Date	**Ship/Facility Name**	**Location**	**Ship Status**	**Injuries/ Fatalities**	**Ship/ Property Damage**	**LNG Spill/ Release**	**Comment**
1944	East Ohio Gas LNG Tank	Cleveland, Ohio, US	NA	128 deaths	NA	NA	LNG peakshaving facility. Tank failure and no earthen berm. Vapor cloud formed and filled the surrounding streets and storm sewer system. Natural gas in the vaporizing LNG pool ignited.
1965		Canvey Island, UK	A transfer operation	1 seriously burned		Yes	
1965	Jules Vernet		Loading	No	Yes	Yes	Overfilling. Tank covered and deck fractures.
1965	Methane Princess		Disconnecting after discharge	No	Yes	Yes	Valve leakage. Deck fractures.
1971	LNG ship Esso Brega, La Spezia LNG Import Terminal	Italy	Unloading LNG into the storage tank	NA	NA	Yes	First documented LNG rollover incident. Tank developed a sudden increase in pressure. LNG vapor discharged from the tank safety valves and vents. Tank roof slightly damaged. No ignition.
1973	Texas Eastern Transmission, LNG Tank	Staten Island, NY, US	NA	40 killed	No	No	Industrial incident unrelated to the presence of LNG (construction incident). During the repairs, vapors associated with the cleaning process apparently ignited the mylar liner. Fire caused temperature in the tank to rise, generating enough pressure to dislodge a 6-inch thick concrete roof, which then fell on the workers in the tank.
1973		Canvey Island, UK	NA	No	Yes	Yes	Glass breakage. Small amount of LNG spilled upon a puddle of rainwater, and the resulting flameless vapor explosion, called a rapid phase transition (RPT), caused the loud "booms". No injuries resulted.
1974	Massachusetts		Loading	No	Yes	Yes	Valve leakage. Deck fractures.

Major LNG Incidents							
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1974	Methane Princess		In port	No	Yes	No	Touched bottom at Arzew.
1975	Philadelphia Gas Works		NA	No	Yes	NA	Not caused by LNG. An iso-pentane intermediate heat transfer fluid leak caught fire and burned the entire vaporizer area.
1977	Arzew	Algeria	NA	1 worker frozen to death	NA	Yes	Aluminum valve failure on contact with cryogenic temperatures. Wrong aluminum alloy on replacement valve. LNG released, but no vapor ignition (LNG liquefaction facility).
1977	LNG Aquarius		Loading	No	No	Yes	Tank overfilled.
1979	Columbia Gas LNG Terminal	Cove Point, Maryland, US	NA	1 killed, 1 seriously injured	Yes	Yes	An explosion occurred within an electrical substation. LNG leaked through LNG pump electrical penetration seal, vaporized, passed through 200 feet of underground electrical conduit, and entered the substation. Since natural gas was never expected in this building, there were no gas detectors installed in the building. The normal arcing contacts of a circuit breaker ignited the natural gas-air mixture, resulting in an explosion. (LNG regasification terminal)
1979	Mostefa Ben-Boulaid Ship	?	Unloading	No	Yes	Yes	Valve leakage. Deck fractures.
1979	Pollenger Ship	?	Unloading	No	Yes	Yes	Valve leakage. Tank cover plate fractures.
1979	El Paso Paul Kayser Ship		At sea	No	Yes	No	Stranded. Severe damage to bottom, ballast tanks, motors water damaged, bottom of containment system set up.
1980	LNG Libra		At sea	No	Yes	No	Shaft moved against rudder. Tail shaft fractured.
1980	LNG Taurus		In port	No	Yes	No	Stranded. Ballast tanks all flooded and listing. Extensive bottom damage.

Major LNG Incidents							
Incident Date	**Ship/Facility Name**	**Location**	**Ship Status**	**Injuries/ Fatalities**	**Ship/ Property Damage**	**LNG Spill/ Release**	**Comment**
1984	Melrose		At sea	No	Yes	No	Fire in engine room. No structural damage sustained - limited to engine room.
1985	Gradinia		In port	No	Not reported	No	Steering gear failure. No details of damage reported.
1985	Isabella		Unloading	No	Yes	Yes	Cargo valve failure. Cargo overflow. Deck fractures.
1989	Tellier		Loading	No	Yes	Yes	Broke moorings. Hull and deck failures.
1990	Bachir Chihani		At sea	No	Yes	No	Sustained structural cracks allegedly caused by stressing and fatigue in inner hull.
1993	Indonesian liquefaction facility	Indonesia	NA	No	NA	NA	LNG leak from open run-down line during a pipe modification project. LNG entered an underground concrete storm sewer system and underwent a rapid vapor expansion that overpressured and ruptured the sewer pipes. Storm sewer system substantially damaged.
2002	LNG ship Norman Lady	East of the Strait of Gibraltar	At sea	No	Yes	No	Collision with a U.S. Navy nuclear-powered attack submarine, the U.S.S Oklahoma City. In ballast condition. Ship suffered a leakage of seawater into the double bottom dry tank area.
2004	Skikda I	Algeria	NA	27 killed 56 injured (The casualties are mainly due to the blast, few casualties due to fire)	NA	NA	On January 2004: No wind, semi-confined area (cold boxes, boiler, control room on 3 sides). The fire completely destroyed the train 40, 30, and 20, although it did not damage the loading facilities or three large LNG storage tanks also located at the terminal. Complete details are pending until completion of ongoing accident investigation.

Source: University of Houston, "LNG Safety and Security", October 2003
Sonatrach, "The Incident at the Skikda Plant: Description and Preliminary Conclusions", March 2004

MARINE SAFETY AND SECURITY REQUIREMENTS

1. Environmental Setting

The proposed Project Floating Storage and Regasification Unit (FSRU) mooring would be located just inside the territorial seas of the United States in position Latitude 33 degrees 51.518 minutes North, Longitude 119 degrees 02.015 minutes West. The nearest land bears 019 degrees true at 12.0 nautical miles (24,000 yds), near the mouth of the Arroyo Sequit on mainland California. The FSRU mooring would be approximately 2.5 nautical miles (nm) from the center of the nearest shipping lane, the southbound San Pedro Channel Coastwise Traffic Lane, which is a recommended lane for large vessels transiting the area. Water depths at the mooring are in excess of 800 meters.

The mooring is 4.2 nm from the Pacific Missile Range, which is commonly used for U.S Navy fleet exercises, missile test firings and gunnery exercises. A warning area is verified to be clear of non-participant vessels and aircraft, by U.S. Navy aircraft and ground based radar, before live firings. The closest warning areas to the FSRU are historically not used as missile impact areas. (DOD 2002)

Yearly commercial vessel traffic in the area consists of approximately 5005 large (over 300 gross weight ton [GWT]) vessels transiting the coastwise traffic separation scheme to and from Los Angeles/Long Beach (10,010 transits in total), approximately 246 large commercial vessels crossing these traffic lanes to enter and leave Port Hueneme, and approximately 120 supertankers and other vessels not using the traffic scheme en route to and from El Segundo refineries and Los Angeles/Long Beach. These vessels range in size from 300 GWT to over 300,000 deadweight tons (DWT) in the case of the supertankers. (USCG 2004, Hooker 2004, Berg 2004, Miller 2004, AJ Wolford 2004)

Commercial fishing vessels in the project area range in size from 20 to 75 feet. According to a recent fisheries assessment, "There are a variety of commercial fisheries conducted in the area: sablefish longline, prawn trap, lobster trap, halibut gillnet, halibut and groundfish trawl, squid purse seine, crab pot and sea urchin diving. However, not all of these fisheries are conducted in the vicinity of the proposed pipeline." No fishing grounds are located in the proposed FSRU safety zone, though many fishing vessels operate and transit within 12 nm of the FSRU. (NRC 2003)

Numerous recreational vessels commonly frequent the 12 nm area surrounding the FSRU and the pipeline, especially those en route to various islands in the Channel Islands Marine Sanctuary. Based on the above fisheries data, conversations with local port directors, and Channel Islands National Park visitation data, an estimated 180 (number being refined as part of risk assessment) recreational boats and commercial fishing vessels could be located within 12 miles of the project at any one time. (Berg 2004, Ortiz 2004, NPS 2003)

2. Security Analysis

Since the events of September 11, 2001, terrorist motivations and actions have been well publicized, and need no further explanation. Therefore, the threat assessment for the proposed Project focused on specific terrorist tactics and operational methods as that would pose the greatest threats to the Project, and the measures available to deter these types of attacks.

Significant examples terrorist methodology of concern include:

- October 7th, 1985 - four Palestine Liberation Organization (PLO) terrorists seized the Achille Lauro, an Italian cruise liner in the eastern Mediterranean Sea. One U.S. passenger was murdered.
- April 17, 1998- A dozen pirates boarded a Singapore Merchant Ship (Petro Ranger) carrying 9600 tons of diesel and 1200 tons of Jet A-1 fuel for delivery to Vietnam. They had boarded the tanker from an unseen small craft and utilized knives and machetes to take over the bridge and divert the ship.
- March 15, 2000- The MT Han Wei, after leaving Singapore, was taken over by a small group of hijackers, who commandeered the ship and cargo of 1,950 tons of gas oil.
- October 12, 2000- The U.S.S. Cole was attacked by a small craft laden with explosives and piloted by suicide bombers in the Port of Yemen.
- October 9, 2001- Terrorists utilized a small high-speed craft laden with explosive to ram a gas tanker while in the Port of Yemen. The explosives failed to detonate; however, it was successful in penetrating the double-hull of the ship spilling 95,000 gallons into the surrounding waters.
- October 6, 2002- The French Tanker, Limburg, suffered a suspected bombing while off the coast of Yemen from a fishing vessel alongside.
- April 25, 2004- Terrorist utilized two medium transportation ships laden with explosives in an attempt to ram or gain a proximity to off-shore oil facilities south of Basra. Before they could complete their approach, U.S. Military Patrol craft prevented them from reaching their targets. In the ensuing attempt at boarding the terrorist ships, the craft's explosive cargos were detonated by the terrorists.
- March 25, 2004, Hamas Militants attempted to attack an Israeli settlement along the coast utilizing wet suits and flippers as a means of ingress. The anti-terrorism community has acknowledged this tactic and an ability to utilize Scuba equipment; however, this is the first known instance their use.
- September 1999- a Right-wing Extremist Group based in Northern California attempted to blow up an LPG Storage facility in Sacramento California with a homemade Rocket Launcher. The launcher failed to detonate; however, the incident caused public concern with the local governing agencies and the LPG Facility Operator.

Airborne Attacks. Although no terrorist organization has utilized small aircraft to attack a target, it is important to mention here that this capability has a potential reality. This fact was discovered in the investigation of the events of September 11th, 2001 where-in the terrorist's involved had taken flight training in the United States.

2.1 Potential Terrorism Scenarios

Potential Terrorism Scenarios for the proposed Project were developed in combination with the historic known capabilities of international terrorism and the public comments and concerns offered during three Public Scoping Meetings relative to this project. A Security Workshop held as part of developing incident scenarios for the environmental review of the proposed Project considered these potential events to determine value ratings on perceived vulnerability based on likelihood of the risk/threat, potential consequences and any identifiable steps that could be taken to prevent or mitigate those risks.

In order to ascertain any steps to reduce those risks, the workshop participants discussed each scenario in detail realizing the need for a full incorporation and review of the project's Security Plan, Operations Plan and standard U.S. Coast Guard (USCG)/Homeland Security procedures (as specified in the Deepwater Port Act [DWPA], Maritime Transportation Security Act [MTSA], and other related National Security policies) was necessary to determine whether there was an actual vulnerability.

In accordance with the confidentiality agreement between Ecology and Environment, Inc. (E & E), The USCG, California State Lands Commission (CSLC) and the project Applicant, actual threat mitigation procedures could not be discussed in detail. However, technical specialists present at the workshop were able to discuss generally both the applicant's Security Plans and standard Security Operations specified by both the Vessel and Port Security Acts.

Regardless of the scenario, it was agreed that any potential result would be identical to an accidental spill, explosion or other event that could occur with the only significant difference being the cause of the event: Manmade versus natural (accidental). Actual mitigation of those events would be based upon the findings of the Hazard Workshop and its consequence modeling.

Potential Terrorism Scenarios

The following are the "Potential Terrorism Scenarios" that were identified. As you will find, there is an overlap of potential consequences on most of the identified scenarios. We have reorganized these scenarios based upon the means of attack/assault with the potential resultant objectives. Further detailed "Preventive Measures/Safeguards" for each of these scenarios are to be found in Section Five of this report.

Risk and Security Assessments must take into account both internal and external threats. Internal threats consist of infiltration and/or effecting a change in current personnel staffing to cause an incident or terrorist act.

A terrorist or criminal group inserting one or more of its members into an employment pool or staff can accomplish infiltration. This procedure may prove more difficult due to most pre-employment background investigations being accomplished by the majority of major employers; and, the increasing level of identifiable threat profiling processes by the Federal Bureau of Investigation (FBI) and other investigative agencies. Affecting a change in a member or members of an employer's staff through indoctrination, threats, blackmail or other means can provide a terrorist or criminal group with a covert agent that might "slip under the radar" due to an employer's trust and familiarization with that person or persons. In addition, that "trusted employee" might have access to security and operations procedures, high-value assets and has achieved full access to the facility. Because of this, it is imperative that an employer conducts periodic investigations of its employees with an awareness of changes in mood, attitude, and/or political, religious, economic or personal attributes.

Terrorist Threat Mitigating Actions

A number of potential terrorist threats were identified by members of the public during scoping meetings. Other approaches can be readily identified by reviewing terrorist attacks that have been attempted or successfully carried out over the past few decades. Potential internal

threats—situations where a terrorist gains access to the vessel-- would include infiltration of the FSRU, supply or crew boat, tug, or liquefied natural gas (LNG) vessel crew.

Although there could be any number of approaches taken to attempt to sabotage systems onboard the FSRU or LNG carrier, there are a number of common protective actions that would be in place to preclude or mitigate internal threats, many of which will already be familiar to members of the public who travel by air, including:

- **Conduct and maintain an extensive personnel background investigation**. This process should be on going to include all permanent and temporary employees, replacement personnel, service, maintenance and other potential vendor/operators that may need access to the FSRU.
- **Conduct physical inspection of all personnel and their gear prior to admittance onboard the FSRU.**
- **Establish a monitored and restricted access system to certain sensitive FSRU areas.**
- **Train all FSRU and Security Personnel in Security Awareness and Prevention.**
- **Establish a Security Reaction Team that can respond either onboard or from Port/Tug support personnel**.
- **Plan and coordinate with the Coast Guard and other area Emergency Responder Agencies with periodic drills and exercises.** Written support agreements with agreeable responsibilities must be tested both in Tabletop and physical drills to ensure all appropriate personnel are capable and knowledgeable of their duty assignments.
- **Insure constant inspection of Tugs and Port dock facilities** to prevent the implantation of hidden explosive devices.
- **Create and monitor secured communications system.**
- **Conduct coordinated drills and exercises in Security Response.**

Several potential External Terrorist Threat Scenarios were developed both during the Public Scoping Meetings and the Security Workshop. Although a trained terrorist group could perhaps accomplish these scenarios, any action would be based upon a desired and attainable objective. Further determination of maximum consequences must be determined to discover whether these actions could provide a catastrophic result (other than the destruction of the FSRU or its related operations). It is unlikely that terrorist actions would be undertaken unless the result would cause widespread destruction, loss of life or economic/political upheaval. Regardless, security procedures must be addressed to deter or prevent said actions. External threats would include a small waterborne craft; use of a commercial aircraft, private fixed wing aircraft, or helicopter as a missile or platform for attack; commandeering a large vessel and using as a ram or as a platform for attack (the Coast Guard advises that there are standard security procedures in place that make this scenario unlikely and preventable); or use of a shoulder-launched missile (unlikely to penetrate hulls or sphere tanks).

Although there could be any number of approaches taken to attempt to damage the FSRU or LNG carrier from a distance, there are a number of common protective actions that may be in place to preclude or mitigate external threats, including:

- **Establish exclusion zone and area to be avoided (published to general public).**

- **Use "Securite" broadcasts to notify mariners of construction or maintenance activity location and duration.** Securite (pronounced say-cur-i-tay) is an internationally recognized marine radio term that simply means that an important broadcast is about to be transmitted regarding navigation or weather warnings. A brief general notice warning is broadcast on Channel 16 (the hailing and distress channel) every 15 to 30 minutes, with instructions to switch to another frequency (which can be any channel except 13 or 16), for specific information and instructions. Vessels would be instructed to contact the FSRU with any questions. Any approaching vessel that does not alter course or slow down as it nears the construction area would be hailed by the FSRU or the tug on station (or both), and the tug on-station near the FSRU could move to intercept vessels not answering hails.

- **Establish twenty-four hour monitoring system such as Radar, Sonar and visual observation**.

- **Establish procedures to prevent intrusion by small craft.**

- **Conduct periodic Emergency Drills and Exercises.** The first priority for emergency response is the safety and security of citizens and port response personnel. In accordance with 33 CFR Part 150.15, the proposed Project would be required to develop a comprehensive operations manual which would include an annex to specifically address contingency response procedures to emergency incidents. Section 150.15(p) – Emergency procedures, requires the deepwater port (DWP) operator to develop response procedures for, but not limited to, the following scenarios:

  - Fire,
  - Reportable product spill,
  - Personnel injury, and
  - Terrorist Incident (in accordance with the DWP Security Plan; requirements for which are outlined in § 150.15(v)).

  The DWP contingency response procedures would identify by name and title, supervisory personnel and personnel with response duties. Non-supervisory personnel would be assigned to individual teams with response to specific emergencies or locations at the port. All response personnel would receive required training for their duties, to include knowledge and use of all emergency equipment (firefighting, lifesaving and communications), but especially the tenants of the Incident Command System, and would participate in mandatory drills and exercises. Exercises and drills should include use of equipment in a simulated emergency response. Representatives from the federal, state and local response agencies (fire, police, hazardous materials, etc.) normally participate in full-scale field exercises, filling key roles in the Incident Command Center, to test the plans. Port response supervisors would document and incorporate lessons learned to improve response procedures.

  In the event an incident clearly exceeds the capabilities of port personnel to respond safely and effectively, the port operator may request the implementation of the Department of Homeland Security National Incident Management System (NIMS).

Developed in 2003 and incorporating lessons learned from previous large-scale disasters (e.g., 9/11, forest fires). NIMS provides a comprehensive, national approach to incident management that establishes national standards for emergency response and is applicable at all jurisdictional levels and across functional disciplines. Its strength is its flexibility is it applicability across a full spectrum of potential and real incidents and hazard scenarios, regardless of size and complexity. NIMS can be specifically applied to provide required response resources to satisfactorily address any potential scenario that could occur at the proposed Project, including LNG release and fire resulting from a vessel collision or aerial strike.

- **Monitor Air space around the FSRU (Radar and Visual).**
- **Establish an Aerial Exclusion Zone (secure airspace in the vicinity of the DWP).**
- **Coordinate Aerial monitoring with the Coast Guard, Air National Guard and/or local Naval Facilities.**
- **Identify and coordinate the appropriate Aerial Response to small craft intrusion, which might include interdiction or destruction of the intruder**.
- **Protect the FSRU Helipad to restrict non-authorized use.**
- **Design and install an effective Fire Protection System with automatic dispersal and shut-off systems.**
- **Engineer systems that would monitor any release with automatic system closures.**
- **Protect all pipelines with concrete or metal guard barriers**.

3. Risk Reduction

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An extremely robust system of treaties, laws, regulations, industry standards and operational procedures are in place to prevent adverse events at the proposed DWP Project. Many of these will be detailed below to give the reader a sense of the level of effort being expended to avoid the potentially significant impacts mentioned above. The independent risk assessment is a small part of this overall effort.

Risk analysis generally encompasses the process by which the causes of undesired events are evaluated against the effectiveness of the preventative safeguards in place to determine the probability of an event occurring. By also examining the possible magnitude of an undesired event's negative effects, both direct (i.e. loss of life and property) and indirect (i.e. public perception, fear), versus the effect of the mitigating measures in place, one can determine which events have the greatest overall potential for harm. High probability events with large negative effects would obviously be the best candidates for further preventative or mitigation

measures and low probability events with small consequences could receive less attention. Each event falling in between in terms of probability and consequence can then receive a commensurate amount of the limited resources available to lessen either factor until an acceptable level of risk is achieved.

Risks can be reduced in several ways. Preventive measures can be taken to decrease the likelihood of an adverse event, and mitigation measures can decrease the impact of such an event while and shortly after it occurs. Both types of measures can be mandated by law, government regulation, or other policy which governs design, construction, operating procedure, training and myriad other functional areas. These measures can be engineering controls (i.e. alarms, safety valves, etc), designed into the project to achieve these goals, administrative measures (background checks, tag-out safety procedures for machinery, etc.) or operational procedures and tactics (training, emergency procedures, fire and flooding actions, etc). Prevention and mitigation are the goals of safety and security programs and operational procedures, all of which implement regulation into practical action.

The sources of an adverse event can be described as accidental or deliberate acts. As covered in earlier sections, the probabilities of accidents can readily be calculated, and the level of risk readily estimated. For deliberate acts, probabilities are dependent on much less definable variables, such as terrorist intent and capabilities. Most people are familiar with the five threat levels that the Department of Homeland Security has devised for land. A similar three level Maritime Security threat level system (described below) is tied to this system, and certain security actions are required at each level. The variables involved with setting the threat level (i.e. intelligence, specific threats, etc.) are not as useful in determining probabilities of an event as those involved in the calculations for accidents. Many general security measures are mandated by regulation per each threat level, however, the range of specific actions taken to stop a deliberate act can exceed what is required and thus may vary widely. Many of the common safeguards against deliberate acts will be discussed below, however specific security measures at Cabrillo Port will not be detailed. Safety regulations and practices will be covered with more specificity. It should be noted that physical consequences are nearly the same for an accident or a deliberate act, which primarily depend on the magnitude of the cargo release involved.

3.1 Risk Reduction Measures - Regulatory Setting

In order to determine both the likelihood of an event and its negative impacts, one must examine the regulatory measures that are in place, as well as their enforceability. But first, it is necessary to answer the following questions: Who has the authority to impose and enforce regulations on the Project and in whose jurisdiction will the project be located? The answers will help determine the quantity and enforceability of these measures. Both authority and jurisdiction are needed to make and enforce laws, regulations and rules.

Authority is given to or assumed by entities based on international treaties and national law; governmental regulations, and company or trade society rules and standards. In determining whose authority applies, one must look at what types of regulated equipment are used, where the Project is built and operated, and what special circumstances apply. In that the Project consists of vessels, pipelines and other regulated infrastructure, is located in the territorial water of the United States, meets the United States definition of a Deep Water Port and involves the transport and handling of cryogenic gasses, many entities (IMO, United States and California legislative and executive bodies/agencies) have authority and the United States and the State of California have enforcement jurisdiction.

***Regulations and operational procedures pertaining to the Prevention and Mitigation of Accidents*:**

Many types of accident scenarios are of concern with this Project, but those with the greatest potential to have a significant impact on loss of life and damage to the environment or the economy all involve loss of cargo containment aboard the FSRU. In general, the larger the magnitude of the cargo loss, the greater the consequences. One scenario in particular, a large, high speed vessel collision with the FSRU, is likely to produce the greatest losses of cargo. The regulatory preventive measures for all vessel traffic will be addressed first, followed by DWP-specific safety and security measures relating to construction and prevention of terrorism.

Vessel Traffic Regulations

Vessel traffic is regulated through a framework of overlapping international treaties and standards, national laws/regulations and local, port or area specific rules. In general, the purpose of such regulation is to prevent vessel collisions, groundings and other accidents, allow for safe operations at port facilities, provide for the security of the United States, protect the environment, promote safety and allow enforcement of other applicable laws. Which particular set of laws, regulations or rules apply to a vessel is primarily a function of the vessel's position, flag of registry and intended destination, but also depends largely on the vessel's type, size, purpose and nature of work. Further rules apply depending on weather, visibility, and other factors. It is important to note that some international treaties and United States laws allow for the temporary control of vessel movements by the U.S. Coast Guard for the purpose of enforcing security, customs, narcotics, environmental, immigration and other laws.

International Treaties

The foundation, or baseline standards, for vessel navigation can be found in the COLREGS, or "Rules of the Road", which are the navigation rules created in the 1972 Convention on the International Regulations for the Prevention of Vessel Collisions at Sea. This international treaty governs the actions of all vessels in International Waters, which for the Project includes the location of the FSRU mooring. They are managed by the International Maritime Organization (IMO), and most nations, including the United States have agreed to be bound by their guidance. These rules determine the actions a vessel must take to avoid collision, and include rules for following joining and crossing traffic separation lanes, actions to be taken in conditions of reduced visibility, required lights and sound signals for vessels, and other rules designed to prevent collisions. Project vessels, including those used in construction, operations, and decommissioning will be bound by these rules. The FSRU, as a permanently moored DWP facility, will not be bound by these rules once moored, but will be while being towed into position for construction, and away for decommissioning.

The United States has, in Title 33 to the Code of Federal Regulations (CFR) Part 162, similarly regulated the actions of vessels on Inland Waters, which are waters shoreward of the COLREGS demarcation lines designated in 33 CFR 110. For the Project, these include waters inside the U.S harbors where project vessels will refuel, resupply and pick up passengers and equipment. The International and Inland Rules of the Road have much in common and the differences will not significantly impact the Project.

After the events of 9/11, the IMO added section 11-2 to the Safety of Life At Sea (SOLAS) treaty. Amongst many new security measures is the requirement for certain vessels to carry

Automatic Identification Systems. An AIS is a radar transponder which provides a vessel's name, location, heading, speed, cargo and other information when struck by the radar pulse from another vessel or ground based radar, such as that used by the Vessel Traffic Service (VTS) at Los Angeles/Long Beach (LA/LB). This information, in addition to the traditional "blip" denoting range and bearing that a radar displays, is of great help in avoiding collisions. The Applicant has indicated that LNG carriers and the FSRU will carry an AIS. (Fuller 2004)

The IMO has also designated Areas To Be Avoided around some of the Channel Islands to augment U.S. laws as mentioned below.

Federal

Per 14 USC 89, United States Coast Guard is responsible for the enforcement of all laws and regulations on U.S. flagged vessels on the high seas, and all vessels within U.S. waters, which include all Project activities with the exception of foreign construction and high seas portion of the towing for the FSRU. As mentioned above, the FSRU will be permanently moored just within 12 nm of the United States, thus all vessels mooring there, declaring their intent to moor there or transferring anything to or from the FSRU will be subject to boarding and control by the U.S. Coast Guard for the purpose of enforcement of all laws and regulations mentioned herein. The U.S. Coast Guard also helps enforce the safety and security zones mentioned below, keeping unauthorized vessels out of such zones to the extent that Coast Guard resources allow. The United States military (including the Coast Guard) is also allowed to take actions necessary for the protection of U.S. citizens and property from hostile acts.

The U.S. laws and regulations that will most affect vessel traffic at and around the FSRU during operations are the Deepwater Port Act of 1974 as modified by The Maritime Transportation and Security Act of 2002. These two bodies of law, merge in 33 CFR 148, 149 and 150. These regulations control all aspects of DWP construction and operation, including all vessel actions within a 500 meter (m) (1,640 foot) safety zone around the FSRU. No non-Project vessel may enter this safety zone except due to forces beyond its control such as heavy weather or equipment failure. Project vessels must obtain permission of the DWP's person in charge of vessel operations prior to entry into this zone. A radar surveillance of the safety zone by the DWP is required any time a LNG carrier gives notice that it is 20 miles out, project vessels are underway in the safety zone, any vessel is about to enter the safety zone, or as the port's security plan requires. Starting at the 20 mile report, the DWP's communications center passes weather reports and traffic information to the tanker throughout its transit. The DWP's own mandatory operations plan must define the routes and speeds to be taken by LNG carriers during approach.

15 CFR 922 mandates areas off limits to commercial vessels (except for fishing) for one nm around the islands of the Channel Islands Marine Sanctuary, which are San Miguel, Santa Cruz, Santa Rosa, Anacapa, Santa Barbara, Richardson Rock and Castle Rock.

In addition, the IMO has recognized areas to be avoided around the islands of the Channel Islands Marine Sanctuary which apply to all vessels involved in the Project. These areas extend approximately six nm from these islands would be avoided by the proposed LNG carrier routes.

33 CFR 26 requires most vessels and dredges in U.S. waters to carry radiotelephone equipment on their bridge which is capable of receiving and transmitting on the VHF marine band. These vessels are: all power driven vessels over 20 m in length, all towing vessels over

26 ft in length, vessels over 100 tons carrying at least one person for hire and dredges operating in or near a fairway or channel. This requirement greatly enhances a mariner's ability to avoid collisions through providing a means of instant communication. The FSRU will have a communications center which will utilize these frequencies in conjunction with radar detection to communicate with vessels in the area.

33 CFR 110 designates special anchorages. The Applicant has stated that no Project vessels (including LNG carriers) will normally utilize anchorages. As anchorages closest to the project area would not be usable for project vessels due to depth or location within areas to be avoided, it is likely that such vessels would (if plans were to change) anchor in a non-designated anchorage near the mainland or in a special anchorage in the vicinity of LA/Long Beach.

33 CFR 147 establishes 500m safety zones around several Outer Continental Shelf (OCS) oil platforms in the vicinity of the project area, including platform "Gina", near the entrance to Port Hueneme. Project vessels over 100 ft in length and all towing vessels will have to stay out of these areas.

33 CFR 160 regulates Port and Waterways Safety. It gives the U.S. Coast Guard Captain of the Port (COTP) the authority to regulate nearly all vessel traffic within U.S. waters in his/her jurisdiction for safety and environmental reasons. This would include forbidding a vessel's entry into port or operation in U.S. waters, holding a vessel in port for repairs, forbidding cargo transfers, or restricting all vessel operations due to weather, port congestion or other safety reasons. This section also mandates that arriving LNG tankers give a Notice of Arrival (NOA) 96 hours prior to arrival to the USCG National Vessel Movement Center (NVMC), giving their position, last port of call, next port of call, crew roster, cargo manifest, time of arrival and reporting any equipment casualties that could affect safety.

In the aftermath of September 11, 2001, the NOA requirements for LNG carriers were heightened. The LNG owner, agent, or master must provide essential information regarding the vessel, status (i.e., material status, cargo carried, crew and persons other than crew) as outlined in 33 CFR Table 160.206—NOA Information Items. If any information provided in the NOA changes subsequent to initial submission, a notice of change must be submitted to the NVMC at least 12 hours before entering port. The LNG owner, agent, or master must provide the following information on INS Form I-418 – Passenger List/Crew List: name (Last [Family], First, and Initial), date of birth, nationality and document number (i.e., passport number), position (e.g., second mate, third assistant engineer, seaman), place and date embarked on vessel, and date separated (if applicable).

For High Interest Vessels (HIVs) such as LNG carriers, the USCG would verify the information, including checking passenger and crew names against terrorist and criminal databases, and disseminate the information to the COTP. No vessel would be allowed to dock at an offshore DWP until the identity of each person on board the LNG carrier had been screened and verified. Any information discrepancies regarding a crewmember or passenger could result in the detention of the vessel until the situation was resolved, which could include replacement of the crewmember. Once moored at the port, the vessel crew would be subject to the requirements and restrictions outlined in the DWP Security Plan in accordance with 33 CFR Part 150.15(v).

33 CFR 161 establishes Vessel Traffic Services (VTS) to track and direct vessel traffic in busy port areas. The nearest VTS is located at LA/Long Beach, and its jurisdiction encompasses a 25 nm arc from Pt. Fermin light. The FSRU mooring and pipeline are all more than five nm

outside of this jurisdiction. However, LNG carriers transiting some routes will be subject to reporting via radio to VTS LA/LB and will be compelled to follow routing and speed orders.

33 CFR 165 establishes safety and security zones in harbors, around vessels carrying hazardous cargoes (including LNG) in specified areas, and at other places or vessels at the discretion of the COTP. Safety Zones protect enclosed areas or vessels for safety or environmental purposes. Security zones are for the protection of their enclosed sites or vessels from terrorist acts or accidents. Both can be either stationary or move along with a vessel. A person or vessel may not enter either type zone without permission from the COTP, or cause anything to be left in such zones. The COTP has the authority to seize control of any vessel in any safety or security zone, and may take action to remove anyone or anything from such zones. It is common local practice to place security zones around LNG vessels that extend 500 yds around a moored or anchored vessel and 1000 yds ahead, and 500 yds to the sides and astern of a moving LNG carrier located in the vicinity of San Pedro Bay. Any such future zones around Project vessels and the FSRU will be at the discretion of the COTP.

33 CFR 165 designates Regulated Navigation Areas. One such area exists in San Pedro Bay. In this area, vessels have to observe a 12 kt speed limit and must maintain a 0.25 nm separation from other vessels. As this area is located within the jurisdiction of VTS LA/LB, vessels in it would be subject to further speed and course directions.

33 CFR 165 also designates naval protection zones, which include an area 500 yds around any U.S. naval vessel over 100 ft in length. All vessels must obtain permission to pass within this zone from the naval vessel or the Coast Guard via VHF channel 16 or other designated frequency. As Port Hueneme frequently hosts large naval vessels, it is expected that Project vessels will need to ask permission from each if transit within 500 yds is necessary.

33 CFR 344 designates naval restricted areas and danger zones. There is a three nm restricted area around San Nicholas Island. No vessels may enter this area without permission from Commander Pacific Missile Range or the Officer in Charge at San Nicholas Island. Multiple naval danger zones and restricted areas exist near San Clemente Island, extending seaward up to 4 nm. All are restricted to any vessel traffic. Another restricted area has recently been approved for Port Hueneme in its entirety, replacing a temporary security zone covering the same area. No vessel may enter Port Hueneme without obtaining permission from Commander Naval Base Ventura County, "Control One" on VHF channel 6.

33 CFR 166 establishes Safety Fairways, in which no artificial structure or artificial island may be located, even temporarily. The only such fairway in the Project area is a one nm wide area centered on the Port Hueneme entrance channel, and extending seaward from the 30 ft depth curve for 1.5 nm. This fairway then turns south for another 1.5 nm roughly following Hueneme Canyon. No project structures or artificial islands are planned in this area.

33 CFR 167 establishes offshore Traffic Separation Schemes and precautionary areas. Nearby Traffic Separation Schemes include the Coastwise Traffic Lanes north of the FSRU mooring as well as the Southern Approach to LA/LB. Mariners in these areas must follow Rule 10 of the COLREGS when operating in or near a Traffic Separation Scheme. Rule 10 dictates that mariners crossing a lane do so at right angles to the lane, and mariners joining a lane do so at small angles to the direction of traffic flow. Mariners are warned to stay out of the separation zone between lanes (except fishing vessels, which may operate in a separation zone). Use of a lane by a vessel is only a recommendation, though actions for crossing or joining and the restriction on operating in the separation zone are all mandatory.

46 CFR 15 requires use of a licensed Pilot for vessels engaged in foreign trade while in U.S. waters. Tankers approaching El Segundo are specifically noted as requiring pilots, as are vessels operating within approximately three nm of Oxnard Beach. Such a requirement is foreseen for the Project, and has been included in the operational plans. Plans call for the Port Hueneme Pilot's Association to expand their workforce to accommodate the Project needs. (Fuller, 2004)

State/Local Regulations

For Port Hueneme, all vessels over 300 gross weight tons require a pilot for entering, leaving or shifting berths. A speed limit of five knots is enforced in the harbor. (Coast Pilot 2004)

FSRU and LNG Carrier Construction Regulations

The Applicant has stated that the FSRU will be built to the same standards as an LNG carrier. FERC recently commented on the fact that LNG carriers and most other oceangoing vessels are governed by rules and regulations established by entities which are generally categorized as the International Maritime Organization, the flag state, the port state, and classification societies. These entities as defined by FERC:

The International Maritime Organization (IMO): A branch of the United Nations that operates under the auspices of the United Nations Convention on the Law of the Sea. The IMO Convention entered into force in 1958, and the new Organization met for the first time the following year. The purposes of the Organization, as summarized by Article 1(a) of the Convention, are "to provide machinery for cooperation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships." The Organization is also empowered to deal with administrative and legal matters related to these purposes. IMO serves to write international requirements for safety and pollution prevention for ships in international service. These rules are then administered in various ways by Flag and Port States.

Flag States: The country of registry for the vessel, such as the United States, Panama, Bahamas, etc. The flag state is the country of the national flag the vessel flies. In IMO Conventions, the flag state is sometimes referred to as the "Administration." The flag state establishes regulations for the construction and operation of vessels registered under its flag. Many of the flag state requirements are based on the vessel complying with regulations of the IMO.

Port State: The authority that has jurisdiction over the port area and waters under national control. In the United States, this is typically the USCG, supplemented by state and local authorities. As defined by IMO, Port State Control (PSC) is the inspection of foreign ships in national ports to verify that the condition of the ship and its equipment comply with the requirements of international regulations and that the ship is manned and operated in compliance with these rules. The USCG defines Port State Control as “the process by which a nation exercises its domestic and or international authority over foreign vessels when those vessels are in waters subject to its jurisdiction.”

Classification Society: A classification society is an industry organization, other than a flag state, that issues certificates of class and/or International Convention Certificates. The certificates of class are based on rules published by the classification society that govern the design and construction of ships and offshore installations. A classification society has specific procedures regarding the level of design review and survey that are required to allow a vessel to be "classified." Classification indicates that the vessel met applicable class rules, international requirements, and specific national requirements. Also, some flag states delegate certain additional review and inspection responsibilities to classification societies.

The rules and regulations of the above entities are broad in scope, covering most every aspect of a vessel's (and thus the FSRU's) construction. As the FSRU and carriers are designed to carry cryogenic gases, additional regulations govern their construction. These IMO conventions include:

- Safety of Life at Sea (SOLAS), 1974/1981.
- Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (Gas Carrier Code), 1983.
- International Code for Ships Carrying Liquefied Gases in Bulk (IGC Code), 1993.
- 1994/1996 Amendments to the IGC (replaced the Gas Carrier Code).
- International Convention on Standards of Training, Certification and Watchkeeping (STCW) for Seafarers, 1978.
- International Management Code for the Safe Operation of Ships and for Pollution Prevention.
- (ISM Code) – adopted by IMO Resolution A.741 (18) in 1994.

Some of the major safety features required by the above entities will significantly reduce the likelihood of an accidental cargo release and will substantially mitigate any release, regardless of cause. These Include:

Double Hull Construction
The FSRU and LNG carriers will be constructed with an outer and inner hull to provide protection against collisions and resultant cargo loss. These hulls are separated from each other by structural members and separated from the Moss spherical tanks by the tank mounts. Thus a collision would need to penetrate three layers to result in cargo spillage.

Separation of cargo holds and piping systems
IGC code requires the structural separation of cargo holds from other spaces, as well as separation of cargo piping from other piping systems. Amongst other things, this helps keep cargo leaks away from potential ignition sources and keeps cargo from inadvertently being pumped through the wrong pipes.

Accessibility for Inspection Access
IGC code requires that a tank be constructed so that at least one side is visible and accessible to inspectors. This allows proper periodic inspection of the tank for integrity and signs of corrosion or stress.

Leak Detectors in Hold spaces
IGC code requires that gas detectors and low temperature sensors be placed in a cargo hold in order to cargo leakage. An alarm sounds if either is detected and appropriate repairs and precautions can be undertaken.

Tank Requirements for Cargo Containment
ICG code requires that a tank be constructed with materials that can withstand the temperatures involved so as to properly contain the cargo, and have adequate relief valve systems to avoid over pressurization.

Structural Analysis
IGC code requires structural analysis of the cargo containment system and specifies individual tank stress limitations.

Secondary containment and thermal management
IGC code requires partial secondary containment to contain leaks and prevent contact of cryogenic liquid with the inner hull. This prevents thermal stress. In addition, insulation in conjunction with a primary and backup heating system must be installed that would keep the cargo from exceeding the thermal limitations of the material selected for the inner hull should the leak prevention system fail.

Tank Construction and Testing Requirements
IGC codes address standards for workmanship, quality, and testing of tanks under construction. Each tank on the FSRU will have had its welds non-destructively tested, and have had a pressure test to insure integrity before cargo is pumped aboard.

Isolation, Construction and Testing Requirements for Piping and Pressure Vessels
IGC code specifies piping thickness, leak testing, pressure testing, isolation requirements, welding requirements and many other aspects of pressure vessel and piping design and construction. This insures the integrity of these systems before any cargo is brought aboard.

Emergency Shutdown Valves and Shutdown Systems
IGC code requires remote control shutdown systems for ceasing of cargo and vapor transfer in an emergency. This system must have the ability to be activated from at least two locations on board the FSRU and will also be automatically activated in the event of a cargo fire.

Pressure Venting Systems
IGC code specifies that appropriate venting of the cargo be installed to keep the cargo under the design pressure of the tank and keep relief valves from needing to operate. The FSRU will use some of this gas for fueling the Submerged Combustion Vaporizers, and will add the rest to the gasified product being pumped to shore.

Vacuum Protection Systems
IGC code requires the installation of relief valves that would prevent under pressurization of cargo tanks in the event that cargo was pumped out without adequately providing for vapor return. The FSRU will have sufficient vapor return capacity to keep the pressures at appropriate levels, however this system will prevent under pressurization should this system fail to be actuated or fail to work properly.

Fire Protection Systems
IGC code requires that LNG carriers have a saltwater fire main system for fighting fires throughout the ship, and fixed dry chemical and CO2 systems for cargo areas and compressor rooms, respectively.

Cargo Tank Instrumentation
IGC code requires that each cargo tank be outfitted with an integrated instrumentation/alarm system that notifies the crew of possible leaks via gas detection and temperature sensors; and tank liquid levels, temperatures and pressures. These systems, as well as the pressure relief systems mentioned above, provide many-layered protection against cargo release either through equipment malfunction or human error.

Additional Gas Detection Systems
IGC code also requires gas detection systems and alarms in spaces where cargo is located, including compressor spaces, spaces where fuel gas is located, and other spaces likely to contain gasified cargo. Venting systems for certain spaces and portable gas detectors are also required.

Automatic Safety Shutdown Systems
IGC code requires that cargo loading areas and the docks be equipped with LNG vapor and fire detection systems that automatically shut down the transfer systems in the event of a leak or fire. These shutdowns can also be manually operated by personnel on the dock (in this case, the FSRU) or LNG carrier.

Loading Arm Emergency Release Couplings
The FSRU loading arms are designed to isolate the flow of cargo and break away from their connection to the carrier if relative motion exceeds safety parameters. This prevents damage to the arms, and averts the spill of cargo which would result from a broken arm. Quantities spilled during this process would be only a few gallons, most of which would be caught in drip trays to prevent deck thermal damage.

Operational Measures for Accidental Release Prevention
In addition to the design regulations mentioned above, the international and national entities with authority to impose such regulations have also provided operational guidelines to reduce the likelihood and impact of an LNG release aboard carriers. The FSRU, as a Deepwater Port of the United States, is primarily guided by the Deepwater Port Act as modified in 33 CFR 148 - 150 by the Maritime Safety and Security Act and other legislation and agency determinations.

These measures include:

- Training,
- Formal Operational Procedures, and
- Inspections.

Training – Training requirements for crews of LNG carriers are specified in the IMO STCW Convention and those for the FSRU are detailed in 33 CFR 150. A wide variety of training is include for both, including marine firefighting, water survival, spill response and clean-up, emergency medical procedures, hazardous materials procedures, confined space entry, and

training on operational procedures. **Specifics are also included in the below summary of the Deepwater Port Operations Manual requirements.**

Formal Operational Procedures – Both the FSRU and the visiting carriers are required to have formal operating plans that cover an extensive array of operational practices and emergency procedures. LNG carriers are required by the IMO to meet the ISM Code, which addresses preparing for responding to emergency situations like fire and LNG releases. The LNG carrier's navigational, pollution response, and some emergency procedures would also be covered in the Deepwater Port Operations manual, which addresses every aspect of the FSRU operations. The minimum contents of this manual are detailed in 33 CFR 150. This manual is extremely detailed and specific, covering every conceivable contingency as well as normal operations. The operations manual must meet all requirements set forth by the US Coast Guard, and be approved by that organization before operations begin.

The operations manual is required by 33 CFR 150 to address the following areas:

The DWP facilities must be clearly described physically and geographically, applicable codes for design and construction must be detailed, schematics of all systems must be included which show the positions of all operations and safety equipment. The communications system must be described and communications procedures laid out.

Procedures for the visiting LNG carriers are also required to be included. Operating hours must be set and sizes and types of tankers that may be received must be described. Navigation standards for the LNG carriers must be set forth, including operating limits for each type of carrier. Speed limits for the safety zone must be specified, as well as the means of tracking, communicating and giving routing instructions to the carriers. Required notices that carriers must give prior to arrival must be detailed. Rules for navigating in the safety zone and for mooring/unmooring must be detailed. Special equipment needed for mooring or navigating must be described. Procedures for clearing all carriers and support vessels away from the FSRU in the event of an emergency or for normal operations must be specified.

Weather forecasting and information dissemination procedures must be set forth. Specific weather limitations must be defined for carrier arrival, cessation of cargo transfer operations and departure of carriers from moorings in the event of adverse weather being forecasted or as it occurs unexpectedly. This includes defining conditions in which the FSRU will be secured and evacuated.

The manning requirements for all operational and emergency situations must be specifically described, with personnel in charge of major evolutions designated by name, in writing. The supervisors will be reviewed by the US Coast Guard to ensure they have the proper qualifications and training to perform their duties.

Procedures for major evolutions, such as cargo transfers, must be set forth in detail. Manning and training requirements, specific duties for watchstanders and supervisors and emergency shutdown system settings must be detailed. Special precautions and handling procedures for LNG must be included.

Maintenance program requirements and specific procedures are required to document the service and repair of cargo equipment, fire fighting systems, safety equipment and cranes.

Occupational Health and Safety training procedures and requirements must be detailed, including: housekeeping, illumination requirements, fall arrest equipment, personnel transfer systems, hazard communication, permissible exposure limits for hazardous substances, protective guards around machinery, electrical safety, lockout/tagout procedures, crane safety, sling usage, hearing conservation, hot work, warning sirens, and confined space entry.

The security plan is included as part of the operations manual and will be covered in detail in the below security section.

An environmental monitoring program must be included, which describes procedures for monitoring the effects of the port on its surroundings. This must include periodic re-examination of the physical, chemical and biological factors examined in the Environmental Impact Statement, as well as air and water monitoring proscribed by other statutes and state law. Detailed studies are required in the event of a spill.

Inspections – For this project, the US Coast Guard has the authority and jurisdiction to perform inspections of Project vessels in U.S. waters, or on the high seas after a vessel states intent to moor at the DWP. Additional inspections may be carried out on LNG carriers by their flag states, by classification societies, and by the owners. Per 33 CFR 150, the US Coast Guard also may inspect the FSRU at any time, with or without notice, for safety, security and compliance with applicable U.S. laws and regulations.

33 CFR 150 mandates that the FSRU be self inspected every 12 months by the owner or operator to ensure compliance with applicable safety and security laws and regulations. The results must be reported to the US Coast Guard COTP within 30 days of completion, and may be checked for accuracy by a Coast Guard inspection at any time. This report must include descriptions of any failure, and the scope of repairs subsequently made. Any classification society certification or interim class certificate must be reported to the COTP as well.

The US Coast Guard has robust marine inspection programs for ships, Outer Continental Shelf structures, DWP Facilities and waterfront facilities. US Coast Guard Officers and Petty Officers receive very detailed training on applicable regulations and inspection techniques. For this project, the most applicable Safety programs include the Port State Control program and 33 CFR 160 for the inspection and routing of visiting ships, and the DWP inspection program specified by 33 CFR 150.

Ports State Control of visiting vessels occurs by means of a US Coast Guard Boarding, targeted at determining the vessels compliance to international IMO standards for safety, pollution control, loading, and watch stander qualification, training and procedures. Vessel safety, sanitation and cargo handling equipment is inspected, emergency drills and procedures may be ran in order to determine crew proficiency, navigation practices are examined, and all pertinent plans, safety management systems and other required documents are examined. The required 96 hour Notice of Arrival for these vessels allows the Coast Guard ample time to determine which vessels to board, whether to conduct the boarding in port or at sea, or even if entry will be denied pending an inspection.

The COTP decides which vessels are at highest risk for non-compliance with IMO conventions through a process by which the following factors are considered: The owner, Flag State and classification society of the vessel - some owners, flag states and classification societies have a history of poor inspection and regulation of their vessels; how many times and how recently a vessel has been boarded or detained for violations previously; and the type of cargo the vessel

is carrying. The vessels having the most factors of concern are boarded immediately, while others may be boarded on subsequent entries into the U.S.

Vessels found to be in non-compliance with IMO standards may be recommended for further flag state or classification society audit, detained in port until their discrepancies are fixed, ordered to anchorage for the same purpose, or forbidden to enter U.S. waters.

33 CFR 160 gives authority to each US Coast Guard District Commander or Captain of the Port to order a vessel to operate or anchor in the manner directed when there is a suspected violation of law or treaty, there is a failure to satisfy the cargo transfer provisions of 33CFR160.113, or if justified by weather, visibility, port congestion or condition of the vessel.

33 CFR 160.113 Gives COTP the authority to prohibit a vessel from transferring cargo or operating on the navigable waters of the US if the vessel's history of accidents, pollution incidents, or serious repair problems creates reason to believe that the vessel may be unsafe or pose a threat to the marine environment. It also allows these restrictions for other reasons: The vessel is in violation of a law or regulation, has discharged oil or other hazardous substance in violation of US law or treaty, fails to comply with Vessel Traffic Service requirements, or does not have at least one licensed deck officer on the navigation bridge that speaks English.

One of the relevant results of this inspection regimen is that every Project vessel and the FSRU will be inspected at least yearly for compliance to all applicable IMO standards and U.S. laws. Equipment, training, qualifications, operating and emergency procedures, administrative controls, and most every other aspect leading to safe operation of the FSRU and project vessels will be checked by the owners, the flag states (for vessels) and the United States for compliance.

Security Measures that Help Prevent Release Incidents Due to Deliberate Attacks

Much as with the prevention and mitigation of accidents, regulation and operational procedures play a vital role in the prevention of terrorist acts. In fact, much of what prevents or mitigates an accident will do the same for a terrorist act (double hulls, fire suppression systems, etc). However, deliberate acts of terrorism expose the Project to new threats, many of which cannot easily be prevented, though mitigative actions may be nearly the same after the incident occurs.

After the events of 9/11/2001, attention was focused on the prevention of terrorist attacks involving vessels and port facilities, resulting in vast changes in operational procedures and followed by new port security regulations. The same concerns that resulted in the Maritime Transportation Security Act of 2002 had profound impacts on other legislation, such as the Deepwater Port Act, as well as on the operating procedures of the U.S. Coast Guard and owners of vessels and Port facilities. The IMO also added Chapter 11-2 to the SOLAS Convention, which provided International Ship and Port Security (ISPS) requirements, which would apply to the LNG carriers in the Project.

The foundation for the FSRU and visiting LNG carriers' security would be the requirements for a **security plan** outlined in 33 CFR 150. This plan would address security issues including, but not limited to: Access control for people, goods and material; monitoring and alerting vessels that approach or enter the ports security zone; identifying risks and measures to deter terrorist activity; internal and external notification requirements and responses in the event of a perceived threat or attack on the port; designating a Port Security Officer; providing identification means for port personnel; security training requirements; actions and procedures that are

scalable to the threat; emergency procedures such as evacuation; special operations procedures (re-manning, refueling, diving, support vessel operations and logistical concerns); and recordkeeping for maintenance, tests and operations outlined in the operations manual.

Radar monitoring of the security zone is a required when any vessel approaches or enters the zone. Such vessels must be identified and warned off via radio.

Additional requirements are included in the ISPS Code for: Security levels; Ship security plans; Ship security alarm systems; Automatic identification systems; Port security plans; Declarations of security; and Facility security plans.

These security measures are discussed below.

Security levels – For the U.S., IMO requirements are covered in 33 CFR 101, which ties the three tiered Maritime Security (MARSEC) level to the five level Department of Homeland Security's Homeland Security Advisory System as the below table depicts:

Homeland **security** advisory system (HSAS) threat condition		Equivalent **maritime security** (MARSEC) level
Low: Elevated: Guarded:	Green Blue Yellow	MARSEC Level 1.
High:	Orange	MARSEC Level 2.
Severe:	Red	MARSEC Level 3.

Specific actions are required of Project personnel at each level, and are detailed in the security plan for the FSRU as well as the Ship Security plans.

Changes in MARSEC level will be communicated by the COTP via Broadcast NTM, and all who are required to have a security plan (facilities, vessels must report attainment of measures in their plan that correspond to the new MARSEC level to the appropriate Coast Guard District Commander.

When the CG determines it is necessary to enact additional measures to counter a maritime threat, the CG Commandant (or delegate) may issue a directive to those required to have a security plan (or portions of, as needed) to take additional security measures to counter the threat. Reporting of attainment of the measure or its approved equivalent is carried out in the same way as a change in MARSEC, but within a time period specified by the directive.

Ship security plans – The flag state will review and approve security plans for visiting LNG Tankers, and the USCG may inspect this document. The ship security plan implementation must be evaluated by an onboard verification by the flag state or a security organization recognized by the flag state before an International Ship Security Certificate (ISSC) can be issued for that vessel. These plans must include provisions for access to the ship by ship personnel, passengers, visitors, etc; restricted areas on the ship; handling of cargo; delivery of ship's stores; handling unaccompanied baggage; and monitoring the security of the ship. These

measures are intended to prevent deliberate destructive act on board a vessel and the possible hijacking of the vessel for use as a weapon (ramming other vessels, bridges, blocking channels, releasing cargo near shore, etc).

Control and compliance Measures for those vessels in violation of this requirement include the vessel's inspection, delay or detention. Vessel operations may be restricted, port entry into the U.S. denied, or the vessel may be expulsed from a U.S. port. Lesser administrative or corrective actions may be taken. The vessel's security plan is subject to CG approval, which may be withdrawn, which would make it illegal for the vessel to operate in, on, under or adjacent to U.S. waters.

Ship security alarm systems – Are required by the ISPS code for Project LNG carriers. These systems are manually operated by the crew in the event of a terrorist destructive act or attempted takeover. An alarm does not sound on the vessel, but does automatically send a signal to appropriate authorities, such as the Coast Guard.

Automatic identification systems (AISs) – As described in the above vessel collision avoidance section, an AIS provides augmented data to radar users, which aid in the identification of vessels. The traffic controllers onboard the FSRU, the VTS and Coast Guard responders will be able to locate and identify vessels outfitted with AIS more quickly and accurately, thus decreasing confusion and response time to an emergency, including security alarm activations.

Port security plans – The ISPS Code requires ports to have a port facility security officer and to develop a port facility security plan which must interface with the individual vessel security plans. In the United States, 33 CFR 103 mandates an Area Maritime Security plan which applies to all vessels and facilities located in, on, under, or adjacent to waters subject to U.S. jurisdiction. This regulation empowers the COTP to set up counsels to advise on port security, write and exercise the area security plan and defines required elements of the plan. (ex. Plan must address actions to be taken for a change of MARSEC, what to do if a vessel security alert system is activated, estimated response and timeframe for a Transportation Security incident, etc)

Declarations of security – Are required by 33 CFR 101 for ports across the US, and are intended to serve as the formal means by which the security actions of the vessel and port are agreed upon during mooring and cargo transfer operations. This declaration must be signed by the vessel and facility security officer prior to commencement of offloading.

Facility security plans – Under the USCG maritime security regulations (33 CFR, Subchapter H), LNG facilities that receive LNG carriers will have to develop a security plan. Like the ship plans that have to meet the ISPS Code, the USCG regulations define areas the facility security plans have to address, including:

- Security administration and organization of the facility;
- Personnel training;
- Drills and exercises;
- Records and documentation;
- Response to change in security level;

- Procedures for interfacing with vessels;
- DoS;
- Communications;
- Security systems and equipment maintenance;
- Security measures for access control, restricted areas, handling cargo, delivery of vessel stores and bunkers, and monitoring;
- Security incident procedures; and
- Audits and security plan amendments.

Like ship security plans, facility security plans have to be approved by US Coast Guard. If a waterfront facility is deemed unsafe or insecure in any way by the COTP, vessels may be prevented from docking there, or be moved if already docked.

Other, control and compliance measures for facilities for violations of these requirements include restriction on facility access, conditions being put on facility operations, suspension of operations, or revocation of approval for the facility's security plan which makes it illegal for the facility to operate.

Coast Guard Operational Measures Applicable to Security of the Project

The U.S. Coast Guard, in addition to its inspection duties, is also an active enforcer of all applicable national and international law on the high seas and within the waters of the United States. The Coast Guard's enforcement of these laws will significantly add to the security of any nearby facility. These actions may include:

- Enforcement of 96-hour Notice of Arrival (NOA) requirements, including vetting crew and passenger lists against terrorist and criminal databases.
- Conducting regular patrols with aircraft and armed surface vessels to support Maritime Domain Awareness (knowing what vessels are within or near U.S. waters).
- Conducting Right of Approach questioning of any vessel to determine county of registry, last port of call, crew nationality and other useful data.
- Conducting background intelligence checks on sighted vessels and like checks on the crews of boarded vessels.
- Monitoring all vessel traffic over 300 GWT with 25 NM of Pt. Fermin Light as part of VTS LA/LB (Note: this area is approx 5nm from the FSRU and covers approaches from the West).
- Conducting armed escorts of vessels deemed to be High Risk.
- Placing Armed Sea Marshals on board High Risk vessels (Note: the determination to provide escort or Sea Marshals for any Project vessel will be at the discretion of COTP).
- Conducting searches of vessels suspected of violating immigration, customs and narcotics laws.
- Inspecting the safety gear of all U.S. flagged and state registered pleasure craft and commercial vessels.

- Conducting searches of foreign vessels with flag state or Master's consent for evidence of violation of applicable laws.
- Acting in accordance with the U.S. Military Standing Rules of Engagement to protect U.S. citizens and property.
- Patrolling, warning and boarding vessels to enforce security zones.

Should the threat level or other circumstance dictate, one can expect the U.S. Coast Guard and other military branches to take measures within their capabilities to provide for the security of the Project. The nearby presence of military vessels and aircraft conducting operations and surveillance of the Pacific Missile Range will also augment Maritime Domain Awareness, and will periodically result in the presence of armed warships within relatively close proximity to the FSRU. All of these vessels could be hailed on frequencies available in the FSRU communications centers, and all are allowed by the rules of engagement to protect themselves, other U.S. military units, U.S. Citizens and property if being attacked.

The COTP may restrict anyone, or anything from entering a waterfront facility subject to U.S. jurisdiction or boarding a vessel subject to U.S. jurisdiction deemed necessary for safety or security. Further, to prevent damage or injury to vessels or facilities or safeguard ports, territory, or waters of the U.S., COTP may establish a security zone, consisting of whatever sections of water and land deemed necessary. No person or vessel may enter this zone or leave any article on a vessel or facility in this zone without COTP (or designee) approval. Any vessel, facility or person in this zone may be inspected or searched, and items or persons may be removed from the zone as deemed necessary. Guards may be posted on any vessel or anywhere in a security zone deemed necessary. Movements of vessels may be controlled as necessary, and within the territorial seas of the U.S., the COTP may enlist the aid and cooperation of Federal, State, county, municipal, and private agencies to assist.

Licenses and required documentation may be required by the COTP for personnel entering a waterfront facility, who may revoke/not approve such based on deciding that the person is a security risk. An appeals process is set up, as is a board to hear such consisting of a Coast Guard Officer and members from company management and a labor representative.

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3. LNG Release and Fire Impacts – Illustrations

Figure C3-1. Worst-Case Credible Release Scenario Case #1

Figure C3-2. Worst-Case Credible Release Scenario Case #2

Notes:

1) All dimensions are shown in meters. 1 meter = 3.2808 feet.

2) FSRU = Floating Storage and Regasification Facility. The FSRU is the point where the LNG is released. The liquid pool of LNG is allowed to spread before evaporation is included in the model. This results in a very conservative estimate for the distance that a plume might travel downwind.

3) The wind is at 6 meters/second (measured at 10 meter height). The wind direction is from left to right along the horizontal axis in the figures (the "x" axis.

4) "Concentration isosurface" simply means the edge of the plume where the natural gas (modeled as methane) concentration is greater than 5 percent by volume. Figures A and B for each case illustrate the dispersion of the natural gas cloud, where the concentration is in the flammable range (5 to 15 percent by volume). Where concentrations are shown as being more than 20 percent, the cloud in this area is too rich to burn.

5) The plan views are views as if you were looking down onto the cloud from an airplane. The cloud was presumed to be symmetrical about the x-axis. The figures show just one-half of the cloud; the other half of the cloud would be a mirror image along the horizontal axis.

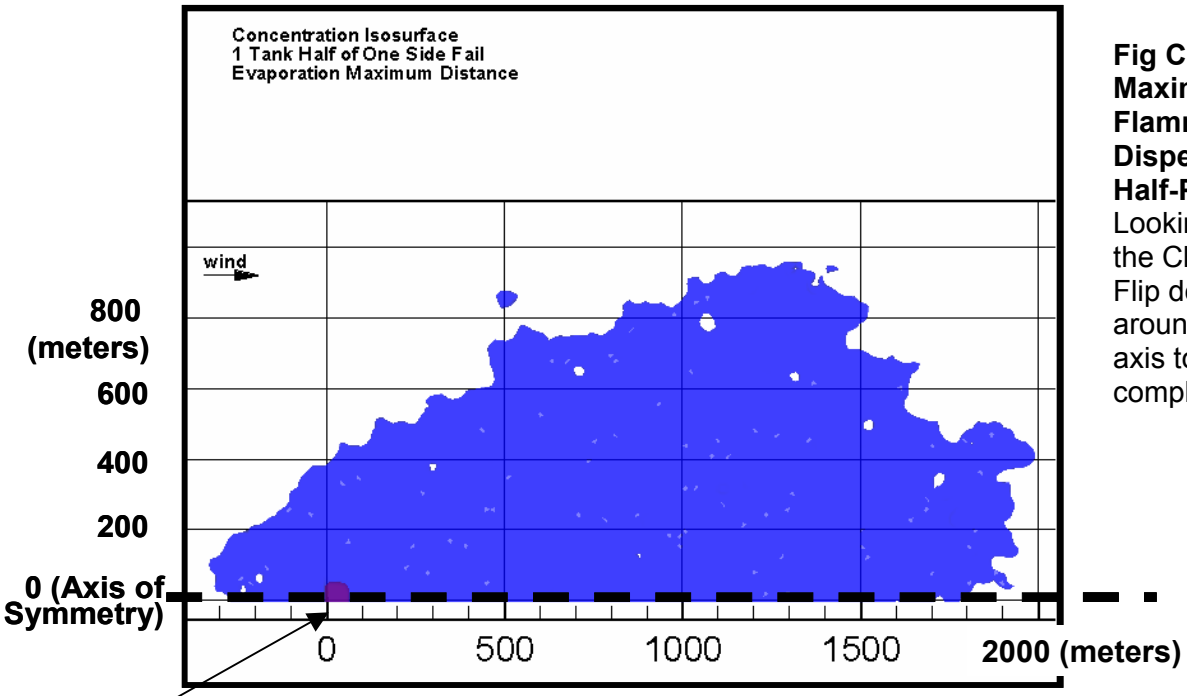

Fig C3-1A. Maximum Flammable Cloud Dispersion Half-Plan View
Looking Down onto the Cloud.
Flip downwards around horizontal axis to envision the complete cloud.

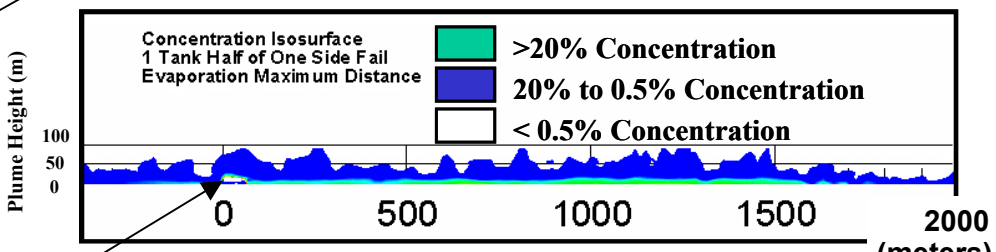

Fig C3-1B. Maximum Flammable Cloud Dispersion, Side View
Looking at Cloud from the side, showing plume heights.

FSRU
(the point of LNG release) is located at coordinates 0, 0 on all figures.

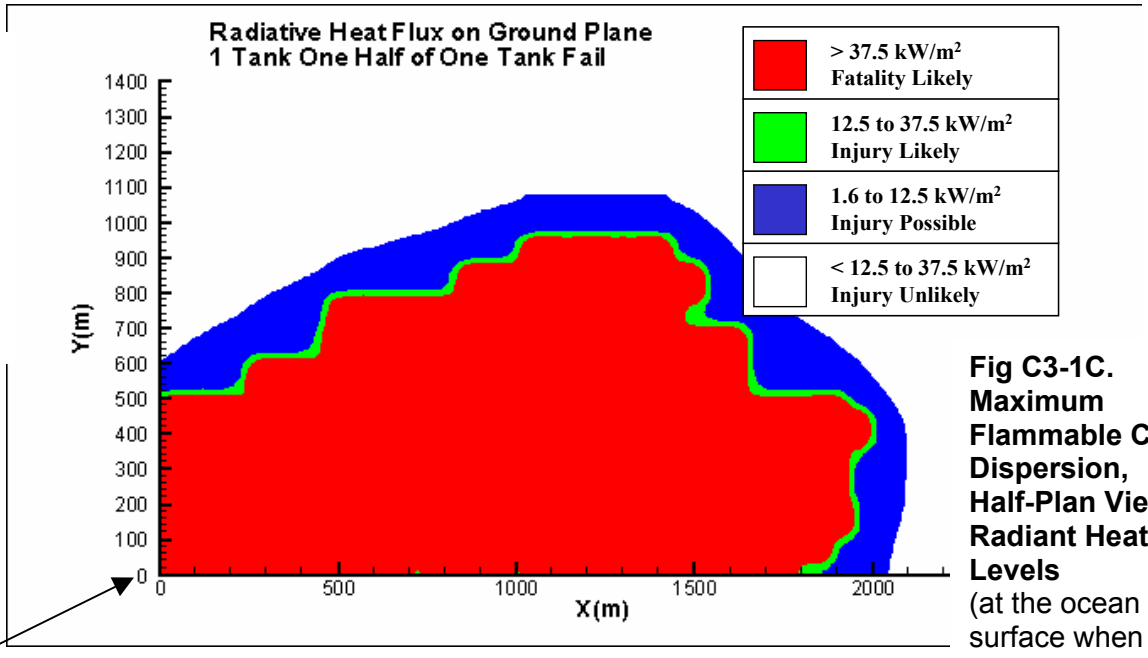

Fig C3-1C. Maximum Flammable Cloud Dispersion, Half-Plan View, Radiant Heat Levels
(at the ocean surface when the dispersed cloud is ignited.)

Figure C3-1. Worst-Case Credible Scenario #1. Plume Dispersion and Radiant Heat Levels

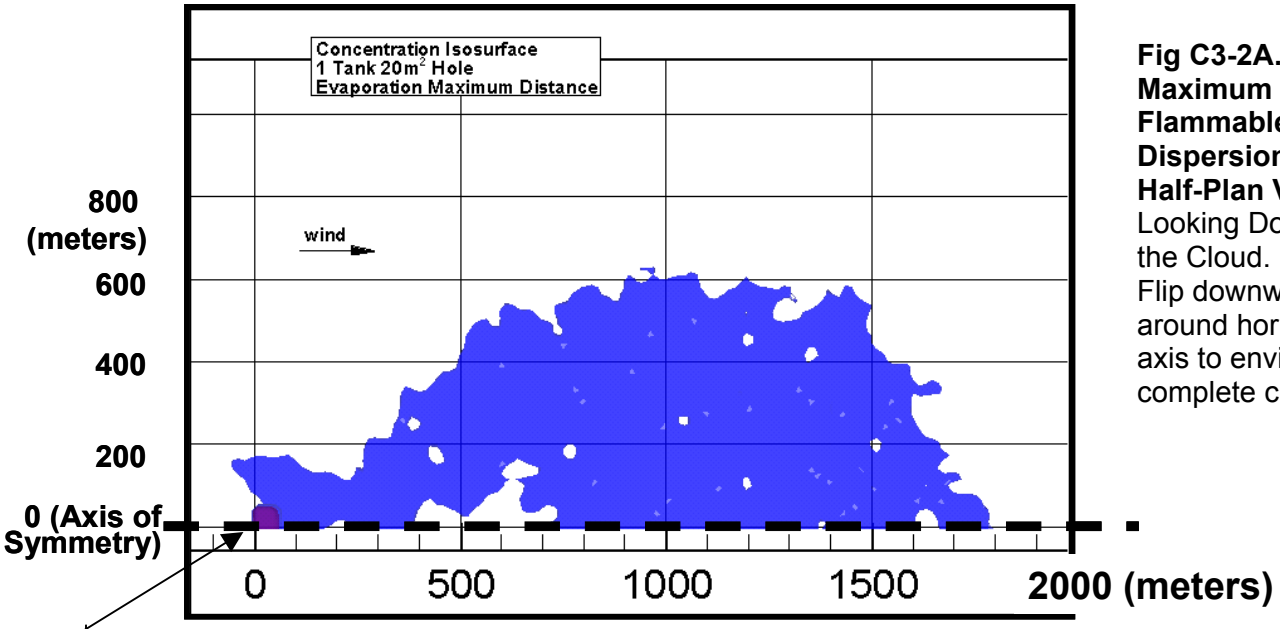

Fig C3-2A. Maximum Flammable Cloud Dispersion Half-Plan View
Looking Down onto the Cloud.
Flip downwards around horizontal axis to envision the complete cloud.

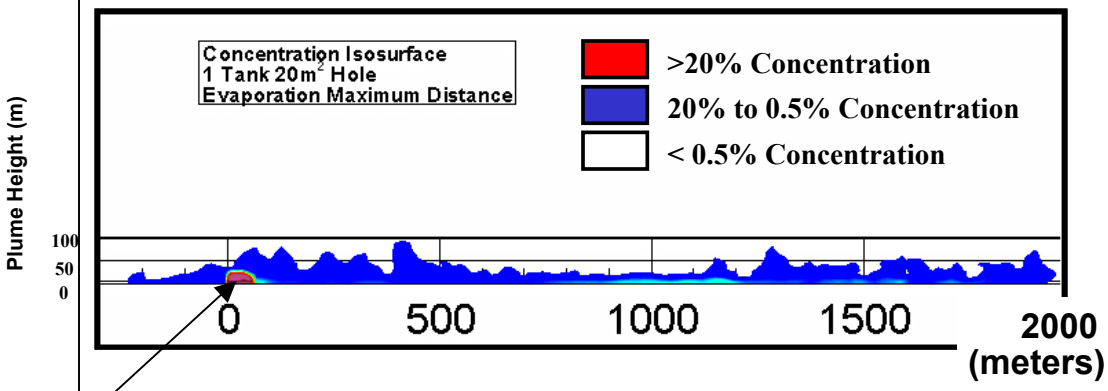

Fig C2-1B. Maximum Flammable Cloud Dispersion, Side View
Looking at Cloud from the side, showing plume heights.

FSRU
(the point of LNG release) is located at coordinates 0, 0 on all figures.

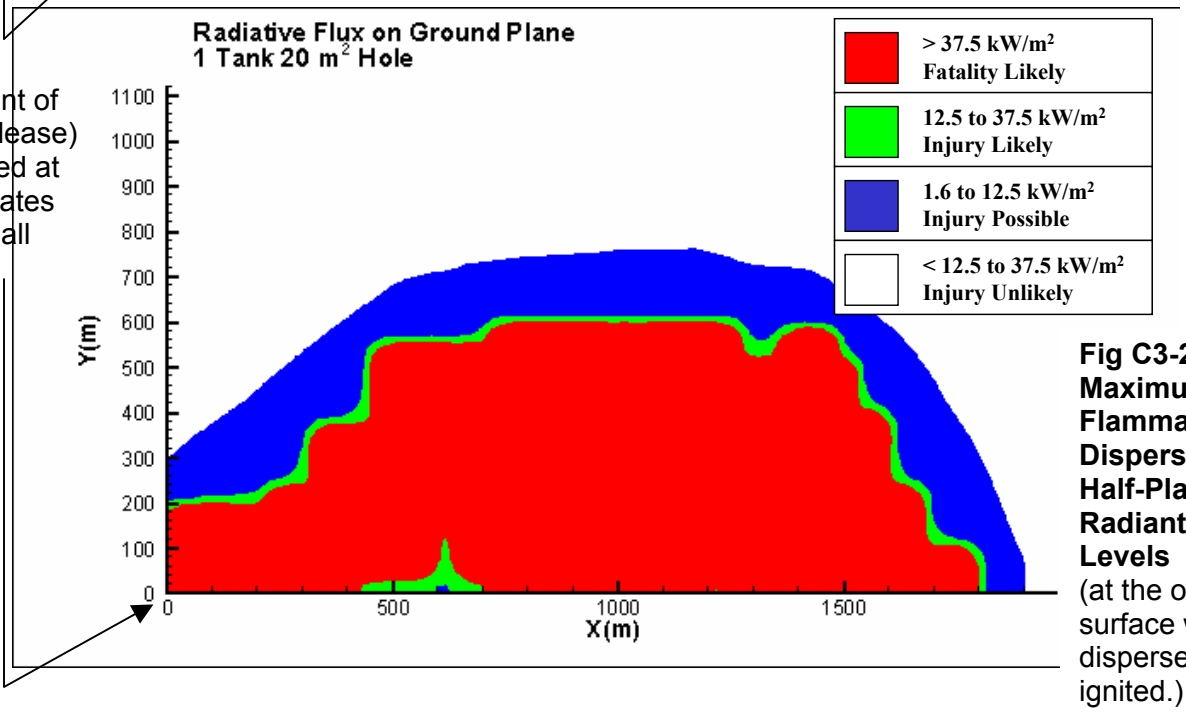

Fig C3-2C. Maximum Flammable Cloud Dispersion, Half-Plan View, Radiant Heat Levels
(at the ocean surface when the dispersed cloud is ignited.)

Figure C3-2. Worst-Case Credible Scenario #2. Plume Dispersion and Radiant Heat Levels

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